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VI. Part of a Letter from Mr Anthony van Lewuenhoek, dated Delft 15. April 1701.
N. S. concerning the Spawn of Codfish, &c.

About the middle of January I observed for several days the *Semen Masculinum*, which we call the *Horn* of a Living Cod-fish : I dwelt the longer upon it, partly because I could not discover any life in those *Animalcula* during my last years observations ; and partly because I intended, if it were possible, to view the said *Animalcula* thro my Magnifying-Glasses, that the Limner might take the exact figure of them, in order to transmit it to the Royal Society.

And whereas I could never before make my observations of the said *Semen Masculinum* but in a Glass Tube, which I used to blow exceeding thin, I had now bethought my self of a more exact way of viewing the same, but it would not succeed ; neither could I bring them to such a Position as that the Limner might take a full and perfect view of them, not only by reason of their wonderful smallness, but also because their Bodies are so tender and soluble, that when I diluted the *Semen* with Rain-water, in order to separate the little Creatures from one another, and afterwards exhaled the watry parts, the little Bodies burst in pieces ; after which I could only see the Tail ; these oval small parts I concluded to be the *Animalcula*, turgid with Water, and burst to pieces ; and these Broken parts seemed to me four times as large as the entire Body of one of those *Animalcula*.

In another place, where a great many of these *Animalcula* lay together they appeared like bright bubbles, each
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of which lay as it were imprison'd in a Circular matter, just as if we should fancy the said Bubbles to be shut up in the little Creature, and that the *Animalculum* itself were surrounded with a watry slimy Matter, and that Matter inclosed in a Skin or Membrane, and that Skin bursting in pieces, just so the Round Parts and the Matter about them offer'd themselves to my view.

I have made my observations more than once of the aforesaid *Animalcula* in several Cod-fish, even in the Male Seed, wherein I little expected to meet with living Creatures, because such Seed was not newly coming away from the Fish, but squeez'd out of the *Vasa Diferentia*, and exceeding thick, like that which issues from the Fish when they throw him down on the ground, and have discover'd an infinite number of exceeding small Creatures (and smaller than I ever thought they were) alive, and swimming together, and view'd them often so long till the liquid Matter in which they swom was quite exhaled, and the *Animalcula* dead, and where they were a little dispers'd, they were burst asunder; but where they lay thicker and closer together, I could not perceive the broken pieces of their bodies.

These frequent speculations, which I continued without intermission, did not only tire my eyes, but occasioned me the head-ach.

Whilst I made my observations of these *Animalcula*, of which there appeared such infinite numbers, without putting them into any liquor, they seem'd to me to be smaller than when I view'd them in a round Glass Tube.

That I might represent to you their smallness, as well as I could, I took one of the Hairs of my Head, and placed it near those Creatures. This Hair was flat, as most of mine are, and the flat side thereof was next my sight, and any body that were to look upon that Hair, and the *Animalcula* together, would easily judge by their Eye, that 90 of those Creatures did not exceed the Diameter

meter of one Hair ; but to keep within compass, I will only say, that as that Hair appeared thro my Glass to be an inch broad, so at least 60 of those *Animalcula* would easily lye within its Diameter.

This being supposed, and the bodies of these *Animalcula* being allowed to be, as they are, Spherical or Globular, I say that 216,000 of those *Animalcula* are equal to a Globe, whose Axis does not exceed such a single Hair's breadth.

As for the Tails, I judge them to be as long as the Tails of those *Animalcula* which are found in the Male seed of a Ram.

One cannot easily perceive these Tails, and I must own that I could not see the tips or smaller end of them ; for as all Tails are thickest in that part which immediately joyns the Body, these were not as thick, even there, as the tips of the Tails of the above-mentioned *Animalcula*.

Whereas there is a vast difference in the Solidity or Consistency of the Skin, Flesh and Bones of a Cod-fish, when compared with the same parts in a Sheep, or other Land-Animal ; so I observed likewise, that the same may be asserted between the several kinds of *Animalcula* found in the Male seed of different Creatures. For, among so many thousands that I have taken out of the Testicles of a Ram, I never found any that brake to pieces ; several of their Bodies indeed, after the exhalation of the moisture, might be observed flat, &c.

I have tryed several times to fetch off the uppermost skin of some of those *Animalcula* belonging to a Ram (which I had kept five months together upon Glass before my Microscope) with a very fine Pencil dipt in water, in hopes of making farther discoveries, but could not succeed.

On the 28th of January in the morning I took a living Cod-fish, and finding that its seed came from it very thin,
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with a little pressing, I took a drop thereof, and in it discover'd a mighty number of living Creatures. I repeated my observation the same evening with the same success, but the next day I could find none of them alive; and whereas I had laid that drop upon a small Copper Plate, I fancied to my self that the exhalation of the moisture might be the cause of their death, and not the cold weather, which at that time was very moderate.

In the beginning of April I took the Male seed of a Jack or Pike, but could discover nothing more than in that of a Cod-fish, but having added about four times as much Water in quantity as the matter itself was, and then making my remarks, I could perceive that the *Animalcula* did not only wax stronger and swifter, but, to my great amazement, I saw them move with that celerity, that I could compare it to nothing more than what we have seen with our naked Eye, a River Fish chased by its powerful Enemy, which is just ready to devour it: You must observe that this whole Course was not longer than the Diameter of a single Hair of ones Head.

VII. *Scala graduum Caloris.*

Calorum Descriptiones & signa.

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CAlor aeris hyberni ubi aqua incipit gelu rigescere. Innotescit hic calor accurate locando Thermometrum in nive compressa quo tempore gelu solvitur.

Calores aeris hyberni.

o, 1, 2.

Calores aeris verni & autumnalis.

2, 3, 4.

Calores aeris aestivi.

4, 5, 6.

Calor aeris meridiani circa mensem Iulium.

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Calor maximus quem Thermometer ad contactum

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